Citation:

Oh K, Hu FB, Manson JE, Stampfer MJ, Willett WC. Dietary fat intake and risk of coronary heart disease in women: 20 years of follow-up of the nurses' health study. *Am J Epidemiol.* 2005 Apr 1; 161(7): 672-679.

PubMed ID: 15781956

Study Design:

Prospective Cohort Study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To investigate the relationship between dietary total fat and specific types of fat with coronary heart disease (CHD) risk over a 20-year follow-up period.

Inclusion Criteria:

Subjects in the Nurses' Health Study who returned the 1980 food-frequency questionnaire (FFQ).

Exclusion Criteria:

- Those who left 10 or more food items blank on the 1980 FFQ
- Those with implausible energy intake
- History of myocardial infarction, stroke, other cardiovascular disease, cancer, diabetes or hypercholesterolemia before June 1, 1980; and women who may have changed their diet because of the presence of these conditions.

Description of Study Protocol:

Recruitment

Female registered nurses aged 30 to 55 years were recruited in 1976.

Design

Prospective cohort study.

Dietary Intake/Dietary Assessment Methodology

A 61-item validated FFQ collecting data on dietary intake during the previous year was used in

1980. This FFQ was expanded to 116 items for use in 1984 to 1998.

Blinding Used

Physicians reviewing medical records and death records were blinded to the participants' fat exposure status.

Statistical Analysis:

- Women were grouped in quintiles according to the percentage of energy obtained from each type of fat
- For each type of fat, relative risk (RR) was computed as the rate for a specific quintile divided by that for the group with the lowest intake
- Cox proportional hazards modeling was used for all multivariate analyses
- To best represent the participants' long-term dietary patterns during follow-up, a cumulative average method was based on all available measurements of diet up to the beginning of each two-year interval was used
- Multivariate nutrient-density models that simultaneously included energy intake were used when examining the effect of isocaloric substitution of dietary fat for carbohydrate
- Tests for trends were conducted by assigning the median value to each quintile and modeling this value as a continuous variable
- Analyses stratified by age and BMI were conducted to assess effect modification by these variables and tested the significance of the interaction with a likelihood ratio test
- The continuous measure of cumulative average of linoleic acid intake was used to fit a restricted cubic spline model and to obtain a smooth representation of the RR as a function of linoleic acid intake.

Data Collection Summary:

Timing of Measurements

Dietary intake was collected in 1980 using an FFQ, and follow-up to assess CHD incidence was conducted through June 1, 2000.

Dependent Variables

CHD: The endpoint was non-fatal myocardial infarction or fatal CHD that occurred after the 1980 questionnaire was returned before June 1, 2000. Non-fatal myocardial was ascertained using physician review of medical records using World Heath Organization criteria based on symptoms plus EKG changes or elevated cardiac enzymes. Deaths were identified from the National Death Index, next of kin or the US postal system and review of hospital and autopsy records.

Independent Variables

Dietary fat intake (total and specific types) was determined using an FFQ.

Control Variables

Age, BMI and other dietary and non-dietary factors that could affect CHD were determined using questionnaires.

Description of Actual Data Sample:

- *Initial N:* 121,700 female registered nurses completed the initial questionnaire in 1976
- *Attrition (final N):* 78,778 female registered nurses
- *Age:* 30 to 55 years in 1976
- *Anthropometrics:* Average BMI was 24kg/m^2
- *Location:* US.

Summary of Results:

- 1,766 incident CHD cases were documented during follow-up (1,241 non-fatal myocardial infarctions and 525 CHD deaths)
- Polyunsaturated fatty acid (PUFA) intake was inversely associated with CHD risk (multivariate RR for the highest vs. lowest quintiles = 0.75; 95% CI: 0.60 to 0.92, P<0.004)
- Trans-fat intake was associated with an elevated risk of CHD (RR=1.33; 95% CI: 1.07 to 1.66, P<0.01)
- Intakes of saturated fat (SFA) and monounsaturated fat (MUFA) were not statistically significant predictors of CHD when adjusted for non-dietary and dietary risk factors
- The associations between PUFA and trans-fat intakes were most evidence among women younger than age 65 years (PUFA: RR=0.66; 95% CI: 0.50 to 0.85, P<0.002; trans-fat: RR=1.50, 95% CI: 1.13 to 2.00, P<0.01)
- The inverse association between PUFA intake and CHD risk was strongest among women with a BMI of 25kg/m^2 or higher (RR=0.63; 95% CI: 0.47 to 0.84, P<0.002)
- Trans-fat intake was more clearly associated with risk of CHD among women whose BMI was less than 25kg/m^2 (RR=1.53; 95% CI: 1.09 to 2.15, P<0.02)
- From 1980 to 1998, the average intake of total fat decreased from 39% to 29%, SFA intake decreased from 15.6% to 9.4%, MUFA intake decreased from 16% to 11.5%, trans-fat intake decreased from 2.2% to 1.6% and PUFA intake increased from 5.3% to 5.6%.

Author Conclusion:

- Higher intake of PUFA was associated with a decreased risk of CHD, whereas a higher intake of trans-fat was associated with an increased risk of CHD, independent of other dietary and cardiovascular risk factors
- The relationship between PUFA and trans-fat intake with CHD risk was strongest among women younger than 65 years of age
- The protective effect of PUFA was strongest for women with a BMI of 25kg/m^2 or higher and the risk of CHD associated with trans-fat intake was strongest for women with a BMI less than 25kg/m^2.

Reviewer Comments:

- *BMI in this study was self-reported*
- *Blood lipid levels were not measured in this study.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	N/A
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes

3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	Yes
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	???
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes

6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	Yes
6.6.	Were extra or unplanned treatments described?	Yes
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	No
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes

8.7.	If negative findings, was a power calculation reported to address type 2 error?	No
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes